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CONTENTS:

	Page.
Proceedings. June meeting	157
I. The Watts Fund	158
II. The Smelting Furnace of the U. S. Mint; by J. C. Booth, Ph. D	159
III. Some Remarks on Dr. Doremus' Simple Apparatus for the Rapid Estimation of Urea; by Wm. H. Greene, M. D.	166
IV. In Rebuttal; by Dr. Charles A. Doremus	168
Abstracts from Chemical Journals, General and Inorganic Chemistry	172
Organic "	173
Analytical "	177
Abstracts of American Patents relating to Chemistry	181

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The **Journal of the American Chemical Society** appears monthly, except during July and August. It will contain all papers read before the Society, as well as abstracts from American and Foreign Journals, and a list of American Patents relating to Chemical Industries.

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The Committee on Papers and Publications respectfully call attention to the resolutions of the Society, requiring that papers be submitted to the Committee before being read.

Members who cannot be present at the meetings, are requested to send their papers in care of the Committee, who can guarantee prompt publication of all articles accepted.

Authors will be furnished, gratis, with 20 reprints of each article published in the Journal, if application for the same be made when the article is sent.

Members are requested to notify the Committee of any change of address, or failure in the delivery of the Journal. All communications relating to the Journal should be addressed in care of the Editor

A. A. BRENEMAN, 97 Water St., New York.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

REGULAR MEETING—June 5, 1885.

Dr. J. C. Booth in the chair.

The minutes of the meeting of May 1st were read and approved.

The following papers were read :

A Criticism on Dr. C. A. Doremus' Apparatus for Estimating Urea, by W. H. Greene, M.D.

"In Rebuttal" a reply to the above, by C. A. Doremus, Ph. D.

A Convenient Furnace for Melting Gold and Silver, by J. C. Booth, Ph. D.

The meeting was then adjourned, until Friday, September 18th, 1885.

C. E. MUNSELL,
Recording Secretary.

THE WATTS FUND.

In addition to subscriptions reported in this JOURNAL (Vol. VII., No. 3), the following have been received :

Prof. A. B. Prescott	$5 00	W. S. Thompson	$5 00
W. M.	3 00	"Cash"	50
A. H. Elliott	10 00	Prof. W. P. Mason	5 00
C. E. P.	2 00	Dr. W. Simon	5 00
Prof. C. L. Jackson	5 00	Prof. J. W. Langley	3 00
F. W. Devoe & Co.	10 00	I. W. Drummond	5 00
H.	2 00	C. S. McLaughlin	5 00

Also the following from the Washington Chemical Society and its members, through the hands of Prof. F. W. Clarke :

Washington Chemical Soc.	$25 00	Thomas Antisell	$1 00
F. V. Broadbent	1 00	T. M. Chatard	1 00
F. W. Clarke	5 00	Wm. Frear	1 00
E. T. Fristoe	1 00	F. A. Gooch	1 00
A. E. Knorr	1 00	E. Richards	1 00
Thomas Robinson	1 00	W. H. Seaman	1 00
G. L. Spencer	1 00	T. C. Trescot	1 00
Wm. Wheeler	1 00	E. Whitfield	1 00
H. W. Wiley	2 00	Dr. J. H. Kidder	5 00
Total			$305

A contribution of $25 has been promised by the Chemical Society of the School of Mines, and other contributions have been more or less definitely promised.

The following extracts are from letters relating to the Fund, received by Dr. Waller :

At a meeting of the Committee of the English Chemical Society for the fund on behalf of the family of the late Mr. Henry Watts, F. R. S., it was resolved, "That the best thanks of the Committee be given to the American subscribers to the Fund, and especially to Dr. E. Waller, of New York, for the steps he has taken in the matter."

THE CHESTNUTS, SUDBURY, HARROW,
May 26, 1885.

MY DEAR SIR : Many thanks for yours of the 14th, enclosing order on Baring's for £23, being a further contribution to the Watts fund. I am happy to say that the fund amounts now to about £1950, so that we hope it will reach at least £2000 before it is closed. I must again thank you and your friends for this kind help. I think I omitted to send you a receipt for the first amount of £45. I, therefore, enclose you one for it, as well as for the amount just received. . . . . .

I remain, yours truly,

W. H PERKINS.

Dr. E. WALLER.

THE SMELTING FURNACE OF THE U. S. MINT.

BY J. C. BOOTH, PH. D.

Its capacity and economy.—The experience of over thirty years in using the gold and silver smelting furnace of the mint at Philadelphia, has gradually led to so many and such thorough alterations in its construction, that nothing remains of the original furnace except the cast iron plates forming the front, sides and top—the mere outside shell, introduced by the late Mr. Franklin Peale, in 1835, the result of his observations and reflections made in Europe on behalf of the U. S. Mint. I can suggest no improvement in the outer form, but confirm Mr. Peale's conclusion of the superiority of the sloping top, which we employ, over the flat top of many European furnaces, because of the greater facility of access offered by the sloping top to the melter in dipping out the liquid metal.

Having carefully studied and modified the interior of this furnace with especial reference to economy of time and fuel in melting—to convenience in melting and casting, and above all, to avoidance of wastage of the precious metals, I deem it desirable to publish drawings of the present furnace, with some details of our mode of working it, for the possible benefit of those interested in works for smelting the precious, or even the commoner metals.

Melting of Steel.—Furnaces for melting steel in crucibles are sometimes sunk beneath the pavement of the melting room, to allow the fullest application of human strength to lift out, by hand, the melting pot, with its heavy contents of melted metal at a bright red or white heat, and pour it rapidly into the molds in a gushing stream, so as to relieve the caster of too long exposure to the intense heat.

Melting Gold and Silver.—Silver and gold are cast at a red heat by dipping up from the pot a few pounds of the melted metal at a time in a small black lead dipping cup, held with tongs, and by carefully pouring it in a small stream into the open gate of the mold, sedulously shunning the loss of a drop by spilling or splashing. A single flashing coruscation is sufficient to alarm the responsible melter for the safety of his account. The heaviest convenient weight to handle and cast safely, is about 120 oz. (over 8 lbs), so that it would require 50 dips to cast out a melt of gold of 6,000 oz. (about 400 lbs.). In like manner

the usual silver melt of 3,600 oz., requires about 40 dips to cast out all the metal, except the small amount left in the pot to start the next melting. The frequent dipping and carrying the dipped metal from the pot to the mold, jealously guarding against loss, the deliberate pouring of a small stream into the narrow openings of the mold, the number of pourings required to discharge one melt, and the necessity of frequently stirring the residue in the pot during the whole casting, to secure uniformity of composition and prevent segregation—all these requisites show the necessity, or great advantage, of having the surface of the metal to be dipped at the height of about 30 inches from the floor, the most convenient height for a workman to employ his force with steadiness, and to continue it for fifteen minutes, the usual time of casting, with the least fatigue.

The views presented above may prove a sufficient answer to the question, often asked, why we prefer melting the precious metals above instead of below the floor of the melting room. One of the above reasons, the convenience of dipping and ladling, applies equally well to copper and its alloys, except for large castings.

Risk of Melting Precious Metals by Blast.—A recent improvement in melting metals is the use of gas and a blast of air, whereby many crucibles are heated at once as in regenerative furnaces, etc., whether the fuel be coal, or artificial, or natural gas. The system seems admirably adapted to steel, and no one thinks of charging loss of metal to the brilliant sparks of fire that illuminate the foundry during casting. Who then would dream of loss of steel in vapor, which has never been seen or heard of? While a single irregular spark in casting gold or silver might make the melter tremble for serious loss, great care can prevent it; not so, however, with the vapor of these metals, which often constitutes a serious loss to the melter, the more so because entirely invisible. That this vapor does constantly rise from the surface of these melted metals in a crucible, over which the draught of the chimney is passing, is clearly proved by the weight of the metal in the crucible constantly diminishing in direct proportion to the length of exposure to the melting heat. An exceedingly thin covering of glass, or even of borax, on the metal in a crucible, diminishes, but does not prevent, volatilization. The more quiet the movement of air, the less the volatilization. Hence the object of the smelter should be

to avoid currents of any kind of air or gas moving around the melted precious metals. They should be melted, with their covering fluxes, in a closely covered crucible, as remote as practicable from gaseous currents. Hence my conclusion that the blast to produce heat should not be employed with gold or silver.

Saving Volatilized Metal.—Extreme care to avoid loss has been extended a step further at the U. S. Mint than is done elsewhere, I believe, and I have reason to know that wastage is thereby diminished. When dipping melted metal out of the large crucibles in the fire, we not only keep the surface constantly covered with borax, powdered charcoal, etc., but since that surface is more or less exposed to the draught of air and products of combustion of the fuel escaping up the chimney which are liable to carry up volatilized metal, we take the precaution of closing a damper in the chimney just above the furnace during the whole time of casting, so that any possibly volatilized metal is thrown out and condensed in the air of the melting room, where it settles on the floor and is recovered with the sweepings at the close of each day.

Cast Iron Ash pit.—Since the smelting furnace of the Mint is presented in considerable detail in the accompanying engraving, I shall only draw special attention to parts that seem to require fuller explanation. The furnace consists of the front, sides and top of cast iron plates, bolted to a square cast iron base, as seen in plan and both elevations. The most striking peculiarity is the cast iron ash pit, which I planned and introduced some thirty years since, in place of the fire brick ash pit and hearth, because these became richly charged with gold and silver grains, and required to be broken up and ground several times in the year in order to procure the grains. Now we gather up these grains daily and in a few minutes' time. The form of the ash pit can be gathered from both elevations, and from sections on A B and C D. It is cast on the middle of the base of the furnace, and in one piece with it, as shown in Sec. A B. It is of uniform height on sides and back (see C D and A B), but the front is depressed nearly to the base (A B) making easy access from the front to the space beneath the fire. (*See elevations*). The peculiar curved form of the bottom facilitates the accumulation of ashes toward the front, and their frequent removal by a shovel. Sec. A B shows the back part of the ash pit strengthened by heavier iron at top and bottom, as more fully ex-

hibited in Figs. 1, 2 and 3, the top being liable to burn from exposure to intense heat, and the bottom liable to fracture.

The *Fire Chamber*, built of ordinary fire brick in square form, as being more readily constructed, and because its corners act as a reservoir of fuel and heat, stands on a square cast-iron base, shown in Fig. 4. Three sides of the square are cast in one piece, and the fourth side, being liable to burn out first, is a separate casting and can be replaced without disturbing the rest. Its position is seen in all the large drawings, but best in Sections A B and C D, where it rests on the top of the ash pit, and just above the grate bars. Section C D alone shows the pile of firebricks on their flat side and flush with the cast-iron base, with large fire slabs of $1\frac{1}{2}$ inches thickness between them and common red brick. The convenience of this arrangement is that when the fire space is to be renewed, the firebricks only are removed and quickly replaced by new bricks set against the slabs. Section C D alone exhibits the true arrangement and dimensions of the fire space and its linings, the others being a vague, typical representation of brickwork without dimensions or special aim. The fourth side of the bed-plate will last three or four weeks, and when burned out is easily replaced, the renewal of the whole requiring only part of one day. The surface of the fire chamber is picked daily for grains of gold and silver, and if the virtue of gentle care in this operation were more in vogue, the life of the lining would probably be doubled in time. The whole of the cast iron bed-plate is replaced once or twice a week. The whole ash-pit enjoys many years of life.

Grate Bars.—While there is nothing peculiar in these bars, which are given in front elevation, and both sections resting close together on their two bearing-bars, Fig. 10 and Section A B, the position of the back bearing-bar is important. It should be brought forward an inch or more from touching the back part of the ash-pit, so that the cooling air passing up behind the bar will insure a prolongation of life.

Furnace Working-Door.—The sliding-top door of the furnace is worth noting. When I first took charge of melting 35 years ago, this door was a massive, curved slab of iron, of great thickness, as if designed to keep the heat in and to last forever, and required considerable force to move it by its heavy handle. Moreover, when the furnace was at its high melting heat, the door was also

hot. To economize heat and protect the men I contrived the door represented in Figs. 5, 6, 7, 8, a combination of cast and sheet iron with a fire tile lining and a space between it and the cast iron top for a cooling current of air, so that when the furnace is at almost a white heat, not even redness can be seen, and the door may be touched without burning. Moreover, instead of requiring much force to move it, a boy can slide it on its little railway. (*Front elevation.*)

Since a small part of the cast iron furnace top, just in front of the center of the fire, is liable to be burned out, it is made replaceable. See Plan, Section A B, and Figs. 11 and 13, noting that 13 is inverted. This small piece, detailed in Fig. 11, and in place in Section A B, will last several months and can be replaced in a few minutes.

Having noticed the prominent features of the furnace with special reference to its economy and utility, I merely note, in closing the description, that in our closure of accounts (at least annually) to determine the losses in working the precious metals to the utmost nicety, we make a thorough cleansing of all the apparatus, furnaces, floors, etc., even to chipping the surface of bricks, etc. These pickings, etc., are ground and sifted repeatedly, until reduced to two conditions, one consisting of grains of precious metals, large and small, which are melted into masses, weighed, assayed, and their value credited to the operator, and the other being "sweep" or fine dust, from which we can extract no more gold or silver, and which is sold to sweep smelters at a fair discount from its assayed value.

Recovery of Gold and Silver from Metallic Iron.—There is a third form of residue, the pieces of iron, tools, grate bars, etc., which always have grains of gold and silver on them and in them, and which cannot be ground to powder. How shall we recover the valuable metals from these?

It was answered thirty years since by heating the iron in the fire (oxidizing it), and making it scale off by beating it with hammers; for gold seems to cling to iron with great tenacity. Thus by alternate heating and hammering all the precious metal was obtained, except what rose up in fine powder up the chimney where the iron was heated, and what remained invisible in cracks and holes in the iron itself. Such a gigantic operation required a force

of a dozen men, seated near the furnaces in the melting room, each with heavy hammers in hand, scaling the hot metal as it came from the fire, and creating a bewildering din, during three or more days of ten hours each.

My first improvement of this process was to convert all the iron into sulphuret of iron, treat it by cold dilute sulphuric acid, and purify the gold and silver residues before melting. Although the process was a marked improvement on the noisy nuisance of the old method, yet it required too long a time and too much space.

My last improvement, which is still practised, consists in the very simple operation of melting all the iron residues from the furnaces, even including grate bars, and keeping them in a quiet melted state, so as to allow the heavier gold and silver to settle out of the iron. When the mass is cold, the precious metal is knocked off the bottom by a hammer as a single, tough king with scarcely a trace of iron in it, while the iron mass above it has never yielded a race of gold or silver to the assayer. Instead of spending three weeks of annual vacation from melting, in hammering tons of accumulated iron, we now melt through the year, whenever convenient, from five to fifty pounds of iron residues at a time. We gathered in one melting last Autumn, a cake of a few ounces of gold and silver from a mass of over fifty pounds of iron in part of a day, and the latter was entirely free from the precious metals. When I first succeeded with this process, I could hardly believe in the perfect separation from iron, and the late Mr. J. Eckfeldt, the best assayer in the United States, doubted it, until by numerous tests made from a piece of some thirty pounds of iron, he found the total absence of gold and silver.

The question may be asked, Is there not a loss by volatilization of gold or silver, even if there is a perfect separation from iron? I can only say that we have found none, but at the same time, I have not yet made crucial experiments to determine this question. I will, however, express the opinion that there is none, because the specific gravity of the two metals carries them rapidly below the iron without alloying with it.

I will now add but a remark on the execution of this process. Since much of the iron from such a source is burnt metal, much oxidized, which therefore obstinately resists melting, or if melted, is rather too thick and viscid to let the gold through it, the simplest

remedy is to add more iron that is not burned, especially some that is highly carbureted, and to assist fluidity by adding little common salt. I need hardly say that the metal must be kept for hours in the liquid state to allow fully for settling.

It remains to state the amount of gold and silver operated on in the U. S. Mint at Philadelphia, in five or six furnaces for silver and one or two for gold.

Taking the last fiscal year (July 1, 1883, to June 30, 1884) we operated on 26,370,821$\frac{45}{100}$ standard ounces of silver (= 1,808,284$\frac{90}{100}$ avoirdupois pounds), and on 764,264$\frac{231}{1000}$ standard ounces of gold (= 52,406$\frac{690}{1000}$ avoirdupois pounds).

The value of the silver is approximately the same number of dollars as of ounces. The value of the gold was $14,218,869$\frac{41}{100}$.

The wastage on the gold was 18$\frac{184}{1000}$ st. ozs., equivalent to $\frac{24}{1000}$ of the legal allowance, which is $\frac{1}{1000}$ of the whole amount operated on.

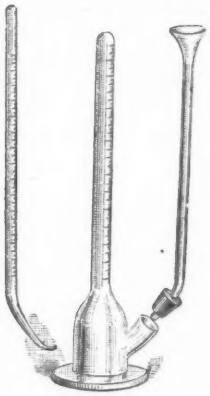
During the same period we made 107,527 lbs. of sweep, containing 242$\frac{196}{100}$ st. ozs. of gold, and 8,991$\frac{71}{100}$ st. oz. of silver. One pound of the general average of sweep contained $\frac{2}{3}$ of one grain of pure gold, and 61$\frac{1}{8}$ grains of pure silver.

U. S. MINT, PHILADELPHIA, June 5th, 1885.

SOME REMARKS ON DR. DOREMUS' SIMPLE APPARATUS FOR THE RAPID ESTIMATION OF UREA.

By Wm. H. Greene, M. D.

In this Journal (Vol. VII, page 72), Dr. Charles A. Doremus, describes an apparatus for the estimation of urea which appears to be a modification of an apparatus described by me in the *Comptes Rendus* (Vol. XCVII, page 1141), and represented in the accompanying cut.



"The general form" of Dr. Doremus' apparatus is not new; it is a Cooper's mercurial receiver, known since 1825, with a bulb blown near the mouth. Neither is the graduation of the tube for the direct reading of the proportion of urea new. This graduation, to which I will revert, was first suggested by Russell and West (*Journal of the Chemical Society*, XXVII, page 749), and more recently by A. W. Gerrard in the *Pharmaceutical Journal* (III, 464).

The manipulations with Dr. Doremus' ureometer are not accomplished with greater facility than with that which I suggested, and his instrument requires a special support while mine is provided with a base.

One cubic centimetre of urine frequently evolves so small a volume of gas as greatly to augment the probable error; for this reason I recommended a gravity pipette which permits the introduction of such a quantity of urine as will furnish a fairly readable volume

of gas. This decided advantage seems to have been overlooked by Dr. Doremus.

He also suggests that the bromine and sodium hydroxide solution be mixed in the ureometer, and it has been claimed that this procedure will avoid irritating fumes. I would especially desire that the method of transferring bromine without the production of vapors should be made public.

The proportion of urea in the urine, and even the daily excretion of that compound, are functions of such variable and uncertain factors that a mere knowledge of their quantities can be of but trivial importance to the practitioner of medicine. The centesimal proportion is naturally dependent on the volume of the liquid ingesta and on the relative activity of the skin and the kidneys, while the experiments of Lehmann and of Franque have shown the influence of the character of the alimentation on the absolute quantity. In perfect health, the daily excretion may be as low as twenty-five grammes during a vegetable regimen—as high as ninety grammes during an exclusively animal diet. Besides this, the quantity of urea eliminated is intimately related to the muscular activity, and it is not improbable that the diminution in the diurnal exertion of urea which is usually observable during sickness may often be a direct consequence of the coincident muscular repose.

Since, therefore, variations of such magnitude may be expected in health, it is evident that observations made during disease can have but little value unless they be made in series and with great care. A knowledge of the percentage of urea is absolutely worthless; the daily elimination is the only factor that can have significance. Then under similar conditions as to diet, exercise, and time given to sleep, the comparison of a series of observations may become the source of useful knowledge.

The error which may be introduced into the result of an urea estimation by neglecting corrections for the influence of temperature and pressure on the volume of gas, is uncertain; it may be inappreciable—it may amount to eight per cent. of the whole quantity. An approximation to the proportion of urea may, therefore, be obtained by omitting the calculations which Dr. Doremus states are repugnant to "the average medical man," and assuming that the same quantity of urea always yields the same volume of gas; but how can such an estimation be useful? Assuredly, any

graduation pretending to indicate variations from a supposed *normal percentage* of urea in the urine is based on the unwarranted assumption that the daily emission of urine and urea is constant.

The ability required to make an analysis and to deduce from it correct conclusions is not greater than that necessary for a very simple calculation. There is, however, a method for the estimation of urea which avoids the necessity of any calculation except a single proportion, and which at the same time gives exact results. It is by a second and simultaneous determination of the volume of gas evolved by the decomposition of a known quantity of urea—say one centigramme—in aqueous solution. Supposing that all the nitrogen eliminated from the urine be derived from urea, the quantity in grammes of the latter in the volume of urine employed will be found by dividing one hundredth of the volume of gas obtained from it by the volume obtained from one centigramme of urea. If "the average medical man" possess a thermometer, a barometer, and a table of the tensions of aqueous vapor, he can make the calculation in less time than would be required for the decomposition of the urea solution.

IN REBUTTAL.

By Dr. Charles A. Doremus.

The author of the preceding article has in two letters, one to the editor of a Philadelphia medical journal and another to Professor Austin Flint, Jr., which appeared in the *Medical News* of May 30th, criticised the instrument presented by me before this Society in March. The tone of the first letter was of so uncourteous a character, as it seemed to me, that no response was made to it. On the appearance of an abstract of it in the *Medical Record* of this city, an answer was written at the suggestion of friends, and would have been published had not Prof. Flint informed me of his intention of presenting to the New York County Medical Society, at Dr. Greene's request, the instrument described on the preceding pages.

Dr. Greene's letter to Prof. Flint appears along with a description of the apparatus which accompanied the instrument and some remarks made on the reclamation of priority and the comparative usefulness of the two ureometers. The publication of that article

would, I thought, render any response from me unnecessary, but the foregoing personal criticism rather than that of the instrument, forces from me a reply

To those who heard the reading of my first communication it must seem incredible that so much has been said regarding the origin of the several parts of the ureometer.

My experience in operating with this instrument shows that for the purpose for which it can be legitimately used the volume of nitrogen evolved from a standard solution is remarkably constant. In the experiments that were made to verify the system of graduation a standard 1 per cent. solution of urea was made. The urea was powdered and dried over sulphuric acid for two weeks before weighing.

When Dr. Greene recommends a physician to prepare a standard urea solution for comparative testing he greatly overestimates the physician's ability to procure the urea, and his possession of the necessary apparatus with which to execute the manipulations. Prof. Wormley, in the paper already quoted, says, "During these investigations it was observed that, so long as the conditions remained the same, the relative proportion of the nitrogen eliminated was pretty uniform. Hence if the volume of nitrogen evolved from a known quantity of urea, under certain conditions, or by a given form of apparatus be determined, the result may be taken as the basis for the determination of the urea in the urine with sufficient accuracy for clinical purposes."

What the volume of nitrogen set free actually is, is differently stated by different observers. Huefner, as quoted by Neubauer and Vogel, gives 370 c. c. of nitrogen as being eliminated from 1 grain of urea, the gas measured at 0° C and 760 m. m. barometer. Wormley gives it as 372 c. c.

No stress was laid on any great originality on my part regarding the invention of the apparatus, and, though no exhaustive bibliography was given of the subject, it was certainly my intention to give such credit as would forbid offence to anyone concerned. Dr. Greene, however, states, "In October, 1884, I brought to the notice of the Philadelphia County Medical Society, and described as a modification that might be home-made, the identical tube apparatus, without base, now claimed by Dr. Doremus" (*Medical News*, April 4th, 1885).

As my experiments were begun last year about this time, I cannot have copied the "identical form" of Dr. Greene's apparatus. The general form and the method of graduation were given credit for in the paper presented in March, and there is nothing of great importance in the fact that the graduation is due to Russell and West. The facility with which an instrument is manipulated depends so greatly on the "personal equation" that I refrain from any further reply on these points. Prof. Flint's remarks in his concluding sentences are sufficient upon this point. The ureometer was purposely made without a base, and it is sold by dealers with or without as desired.

Dr. Greene seems to have thought of some advantages in that form of instrument when he devised his home-made apparatus.

I did not "overlook" the advantages that might result from using 5 c. c. of urine instead of one, but made careful experiments and decided that for the purpose for which the ureometer was intended there were more reasons for adopting the latter quantity for the test than the former.

Dr. Greene, in his Medical Chemistry, 1880, p. 110 *et seq*, gives only two processes for the determination of urea by the hypobromite solution and directs the use of 1 c. c. of urine in each case.

Prof. T. G. Wormley, in a critical examination of the hypobromite method published in the American *Journal of Medical Sciences*, July 1881, p. 128, adopts 1 c. c. of standard solution of urea for his experiments, and recommends the use of that quantity of urine in the practical examination of urine.

Where larger apparatus can be conveniently used there is certainly no objection to the use of 5 c. c. of urine, but I tried to reduce the bulk of the apparatus without diminishing sensibly its accuracy.

The method of transferring the bromine was described in my first paper. Unless one desires to be captious, it can safely be said that in drawing the bromine up in a nipple pipette by relaxing the nipple that has been compressed before the pipette is introduced below the level of the bromine and then, by quickly removing the pipette and squeezing the nipple, expelling the bromine below the sodium hydrate solution previously poured into the ureometer, "the bromine is transferred without the production of vapors."

NOTICE.

The accompanying text is the conclusion of Dr. Doremus' article in Vol. VII, No. 6, of the Journal of the American Chemical Society, which was omitted in making up the Journal during the absence of the Editor.

A. A. B.

In regard to barometric measurement these same gentlemen state on the same page: "Alterations in the barometer produce so small an alteration in the volume of the gas that it may generally be neglected, *e. g.*, if we have 30 c. c. of nitrogen, the quantity we prefer dealing with, an alteration of 1 inch in the height of the barometer would produce an error in the amount of urea of about 0.003; but for more exact experiments, the correction for pressure should be introduced."

Russell and West give the practical basis for 65 F. and 30 inches barometer at 371, which would correspond with 340.5 at 0° C. and 760 m. m. Greene states it as 354.3 c. c.

I am inclined to agree with Prof. Wormley in his statement that in the apparatus he employed all the nitrogen is evolved, but think that the shaking, possible in the manipulation, causes a slight quantity of gas to be expelled from the hypobromite which is retained in that liquid, whereas, in the instruments under discussion, a much larger volume of reagent is used and there is no agitation.

I decided on adopting Russell and West's graduation only after repeated trials and comparative tests. A strong hypobromite evolves a little more gas than the diluted solution when used in my ureometer, but the gas collects so much more rapidly with the diluted reagent that for practical working I prefer to use it. A decided advantage results if the diluted reagent is employed in that it may be mixed in the ureometer.

Unless chemists agree upon the amount of nitrogen eliminated, under specific conditions, it is useless to attempt to make absolutely correct tests with the hypobromite method. Dr. Greene seems unnecessarily to complicate matters for the physician. If a physician happens to possess a barometer graduated in m. m. (otherwise he must calculate from inches to m. m.) and a centigrade thermometer (or again he must convert F. to C. degrees) he need not have a table of tension of aqueous vapor nor go through the calculation of the

value of 1+0.003665 t., as Dr. Greene proposes, but may use Dietrich's table, which gives the weight of 1 c. c. of nitrogen for all temperatures between 10° and 35° C., and barometric pressures from 720 to 770 m. m. The weight of the nitrogen multiplied by 2.14 gives the weight of urea.

Prof. Witthaus has rendered this table of Dietrich's accessible to the medical profession by publishing it in his two works on Medical Chemistry. Dietrich also gives a table of the absorption of nitrogen by the hypobromite, which shows that for 60 c. c. of hypobromite used there is an absorption of 0.53 c. c. of nitrogen when 20 c. c. of that gas are set free.

Dr. Greene does not introduce this factor of absorption by the hypobromite, which may be greatly influenced by temperature and pressure in his formula, except in the factor 354.3 which remains constant, according to him, for all temperatures and pressures.

I fail to comprehend why Dr. Greene should made the following statement: "At the same time he does not appear to comprehend the importance of correction for temperature and pressure even in approximate measurement of gases," in face of the fact that, in my article read in March before this Society, I state in regard to the method of Dr. Williams, "The leveling of the water is annoying, and, though the determination can be made more accurately when corrections for temperature and pressure are used in the calculation than with the process to be described, there is, as it is practically carried out, scarcely any advantage."

In regard to the new form I stated "usually the test is sufficiently accurate to obviate the necessity of reading the temperature or lowering the ureometer in water to eliminate the error due to difference in level in the liquid in the two arms of the apparatus. The instrument is graduated on the practical basis ascertained by Russell and West for 65 F."

The instrument under discussion is not capable of giving results

so strictly correct that they should be taken, even with all the corrections as the basis, for instance, of a physiological research. There will always be some escape of nitrogen around the bend which can only be guessed at. This holds good of Dr. Greene's apparatus. The hypobromite method is not yet capable of such application, and it is folly to expect accuracy from it. For clinical purposes and the daily examination of urine from patients undergoing diagnosis or treatment, it is capable of showing fluctuations in the excretion of urea, and any physician using it for such purposes will doubtless know how to employ it under similar conditions.

The absolute bodily temperature is rarely ascertained by a physician, yet clinical thermometers yield valuable information regarding the fluctuations in temperature in given cases. That the object I had in view has not been misunderstood, except perhaps by Dr. Greene, permit me to quote Prof. Flint's remarks in the *Medical News* of May 30th :

> Each of the two forms of apparatus is designed to present a convenient and rapid application of a well-known method for the quantative determination of urea. There seems to be no ground for controversy as regards originality or priority ; and practitioners will undoubtedly select the apparatus which is most convenient.
>
> Dr. Doremus presented, by request, at a previous meeting of the Association, the form of apparatus which he uses in teaching, as possibly the simplest and most convenient for medical use. The graduation was made experimentally, at a temperature of 65° Fahr., with a uniform volume of liquid, so that, these simple conditions being fulfilled, the estimates are sufficiently close for all practical purposes, and "corrections for temperature and pressure" are unnecessary.
>
> In neither of the two forms of apparatus is there any new principle involved, and they are to be compared merely from the point of view of simplicity and convenience of application.
>
> The strictures made by Dr. Greene, accusing Dr. Doremus of having "acted either ignorantly or with but a slight appreciation of the ethics of scientific men," seem to me to be uncalled for. The advantages of both instruments commend themselves on their

simple merits to practitioners, who will, of course, select the one which seems the better adapted to their use. This question I leave to the members of the Association for their decision individually. For myself, I had seen a description of Dr. Greene's apparatus before I made my remarks at a previous meeting; and I simply commended what I conceived to be improvements on all previously described forms of apparatus, without comparing any one form with another.

The Society will, I trust, pardon this lengthy reply to Dr. Greene's criticism when I state that I have endeavored to answer each point he has brought forward and to end what seems to me an uncalled-for discussion.

I will not attempt to discuss Dr. Greene's remarks of a physiological character. They represent to a great extent his individual opinions, and I decline to prolong this debate by taking up new issues.

His remarks on the percentage composition are unnecessary, since the calculation to per cent. was added merely for convenience in reference, and for those who feel inclined to adopt that method of comparison.

Most works on urine give the centesimal composition of the urine though they direct that the calculations be made on quantity voided in 24 hours.

Tyson in his edition of 1883 says, in regard to the determination of urea, p. 106, "whence can be calculated either the percentage or the 24 hours quantity."

Most physicians know that to obtain a just idea of the condition of the urine the specimen examined should represent a known portion of the entire quantity voided in 24 hours. For all quantitative estimations a specimen taken from the total voiding should be analysed. When this is done and the volume of urine is close to 1,500 c. c. or can be diluted to that volume, then the normal mark on the apparatus gives at least approximate knowledge of the excretion of urea. It would be absurd to suppose that any guide could be given that is arbitrary. It is distinctly stated that the ureometer is graduated for 65° F. This temperature is easily obtained for the instrument, if necessary, at all times of the year by placing it for a few minutes in water at that temperature. That particular temperature was selected by Russell and West as being that of apartments where the instrument they devised would be most frequently used. Also because "a fortunate compensation of errors occurs with this form of apparatus under these circumstances. The tension of the aqueous vapour, together with the expansion of the gas at this temperature, almost exactly counterbalances the loss of nitrogen in the reaction." (*Journal Chemical Society*, Vol. 27, p. 751.)

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

Preparation of Cyanogen in the Wet Way. G. JACQUEMIN.

The usual process, by the action of a concentrated solution of cupric sulphate on a saturated solution of potassium cyanide is incomplete, only half the cyanogen being evolved.

In the process of the author all of the cyanogen of the potassium cyanide is obtained and the gas is pure.

Two parts of cupric sulphate dissolved in four parts of water are placed in a retort or in a balloon, on a water-bath, and, by means of a stoppered funnel, a concentrated solution of one part of pure potassium cyanide is gradually introduced. The reaction begins violently at ordinary temperatures and when the evolution slackens the temperature of the water-bath is elevated to quicken it. 10 grms. of c. p. KCN give 850 c. c. of pure cyanogen. Commercial pure KCN gives the same result, but the gas sometimes contains traces of CO_2.

There are two processes for withdrawing the cyanogen of the copper cyanide. 1. Decant the liquid remaining in the retort or balloon, wash by decantation, and add a slight excess of ferric chloride of 30° B., or higher. The action commences in the cold and a slight elevation of the temperature produces an abundant evolution of cyanogen. The ferric chloride passes to the state of ferrous chloride in transfering the copper cyanide to chloride, which sets free the cyanogen and forms cuprous chloride which turns to cupric chloride at the expense of the excess of persalt of iron. 2. Add to the washed copper cyandide some manganese peroxide and acetic acid. Heat slightly. Acetates of copper and manganese are formed and cyanogen is evolved. When the operation is ended the evolution tube is replaced by a receiver, sulphuric acid is added and the mixture of the two acetates is distilled to collect the acetic acid, which is used again. (*Comptes Rend.*, **100**, *1005.*) C. E. M.

Ultramarine Blue from Silica (without Alumina) by Use of Heat (1). FR. KNAPP.

The author has attempted to form ultramarine blue from silica, soda and sulphur, according to the formula prescribed by Gmelin,

varying the conditions of the experiment, still without success. The method of Rickman he has also examined. From his experiments he concludes that there is not absolute proof of the impossibility of forming this compound, yet its successful formation is dependent upon a number of conditions not given by and probably unknown to the authors mentioned. (*J. f. prakt. Chem*, **31**, *154*.) F. P. V.

Reagent-bottles. A. Gawalooski.

The new reagent-bottle recommended in this paper is one with a revolving cap having a projecting lip which fits over a spout let into the neck. The reagent is poured altogether from this side-spout. Figures and full explanations will be found in the original article. The advantages are: 1. No volatile reagents can force their way in. 2. No fixing of the stopper by caustic alkalies, &c. 3. Ease of handling and freedom from impurities, as there is no stopper to be removed. (*Zeit. anal. Chem.*, **24**, *216*.) F. P. V.

ORGANIC CHEMISTRY.

Chemical Constitution of Isatin. H. Kolbe.

Isatin oxidized by chromic acid yields isatoic acid. This, heated with water, yields carbon dioxide and orthamidobenzoic acid. With hydrochloric acid the chloride is formed. Sulphuric and nitric acids act similarly. Dissolved in alcohol and acted upon by hydrochloric acid gas, ethyl orthamidobenzoic hydrochloride is formed, which is decomposed by water. Isatoic acid with bases in the cold evolved carbon dioxide, so salts could not be formed. Ammonia solution gives ammonium carbonate and orthamidobenzamide. Anilin acts similarly. Concentrated nitric acid gives nitroisatoic acid, which is more stable than nitric acid. This heated with hydrochloric acid or water gives a strong acid resembling metanitro-orthamidobenzoic. Reduction of the nitro-acid with tin and hydrochloric acid gives the hydrochloride of α diamido-benzoic acid. Sulphuric acid gives the sulphate. Treatment of isatoic acid with nitrous acid gives α nitrosalicylic acid. The author concludes that the formula C_4H_4 NCO—COH gives the best explanation of the above facts. (*Journal f. prakt. Chem.*, **30**, *467*.) F. P. V.

Isatoic Acid. E. V. MEYER.

This acid has the same composition as anthranilcarboxylic acid and shows similarity in properties. Chromic acid or potassium permanganate causes partial decomposition of isatoic acid with formation of a substance identical with anthranilcarboxylic acid. This may be an isomer then. Ethyl and methyl alcohol acting on isatoic acid yield the ethers of anthranilcarboxylic acid. The action of benzoylchloride, phosphorus pentachloride and acetic anhydride has been studied and the examination of the halogen derivatives begun. (*Jour. prakt. Chem.*, **30**, *484.*) F. P. V.

Phenyl Cyanate (preliminary notice). FR. GUMPERT.

Hofmann found that phenyl cyanate united direct to urethanes with primary alcohols. Isopropylalcohol gave crystals of the constitution of the phenylcarbaminicisopropyl ether. So with tertiary alcohols. Isatin unites with this body, molecule for molecule, giving a substance melting at 180° C., with decomposition. The chloroform solution of phenyl cyanate was treated with chlorine and also with bromine. The action of phosphorus pentachloride, acetic anhydride, anthranilic acid, benzaldehyde and benzoyl chloride was examined. (*Jour. prakt. Chem.*, **31**, *119.*) F. P. V.

A new Toluylendiamin. E. LELLMAN.

The above described nitrotoluidin yields on reduction a new diamidotoluol. This reduction was carried out in the usual way with tin and hydrochloric acid. The base melts at 61°–62° and distills at 225°. Several derivatives, toluylenthiourea and diallyltolulvlenthiourea, were formed and analyzed. (*Annalen d. Chemie.*, **228**, *243.*) F. P. V.

A New Nitrotoluidin. LELLMAN and WÜRTHNER.

Acettoluid is added to a mixture of fuming nitric acid and glacial acetic acid. The resulting nitro- compound is separated by water dissolved in alcohol, boiled with potassium hydroxide and then one-third its volume of water added. Two kinds of crystals are gotten which are separated and purified. One melts at 129°.5, and is metanitroorthotoluidin, the other melts at 158° and is unsaponified nitroacettoluid. The separation of the free nitrotoluidin

is effected by concentrated hydrochloric acid. The melting point then is 97°. Experiments were also made to determine the position of the nitro- group. (*Annalen d. Chemie.*, **228**, *239.*) F. P. V.

Constitution of the three Dinitroparaxylols. E. LELLMAN.

The melting points of these bodies range from 93° to 124°. The constitution was determined by the above tests. In the dinitroparaxylol melting at 93°, the nitro- group was shown to have the ortho- position; in that melting at 124° it was shown to have the meta- position, leaving only the para- position possible for the third. (*Annalen d. Chemie.*, **228**, *250.*) F. P. V.

Methods for Determining the Constitution of Aromatic Diamines. E. LELLMAN.

1. Ammonium sulphocyanate is added to a solution of the salt of the diamine; it is then evaporated to dryness, heated an hour at 120°, washed with water and treated with an alkaline lead solution. To this orthodiamines impart no color, meta- and paradiamines give up their sulphur, turning the solution black. 2. A compound is formed in alcoholic solution with 2 mols. of oil of mustard, allyl thiocarbimide, and then melted. If an orthodiamine was used the larger portion of the melt solidifies to a mass of crystals, if a metadiamine the product remains fluid, if a paradiamine it is entirely decomposed. The test first given is used along with this for confirmation. (*Annalen d. Chemie.*, **228**, *249.*) F. P. V.

On a New Base found in the Animal Body. A. KOSSEL.

This base was found in the pancreatic gland, and was obtained by the same process which author used previously for the preparation of guanin and hypoxanthin. The larger part of the base is precipitated by ammonia, along with guanin and separated from the latter by means of its chloride. Crystallizes in crystals two centimetres long. (*Ber. d. chem. Gesell.*, *1885*, **79.**) J. H. S., Jr.

On Putrefication Bases (Ptomaines) from Fish. O. BOCKLISCH.

Brieger stated in a previous communication that he had found in certain putrefying fish, the following bases: Neuridin $C_5H_{14}N_2$,

ethylendiamine, muscarin, and ganidin, $C_7H_{16}NO_2$, and it was the intention of the author to examine other kinds of fish for the same products. The products of decomposition of fresh-water fish, differ materially from those of salt-water fish. (*Ber. d. chem. Gesell., 1885*, **86.**) J. H. S., Jr.

On Paraamidooctylbenzene, Paraamidocaprylbenzene and an Amidooctyltoluene. A. BERAN.

If primary amines of the aromatic series be heated with the alcohols of this series, phenols, and zinc chloride, secondary amines will be formed. If, on the other hand, alcohols of the fatty series be used under the same circumstances, primary amines, and amines of high molecular weight, also bases in which hydrogen has been replaced by alcoholic radicals, are formed. From aniline para-compounds are obtained, while o-toluidine yields ortho-compounds.

Paraamidooctylbenzene.

C_8H_{17}, C_6H_4, NH_2

This was obtained by heating a mixture of 7 grms. normal octyl alcohol, 25 grms. aniline-zinc chloride (2 mols. aniline to 1 mol. zinc chloride) for 8 hours to 270–280° C. Boils at 310–311° C. (corr). Is colorless and odorless when freshly distilled, but darkens slowly when exposed to the air. On cooling it crystallizes in snow white large leaflets, which melt at 19.5° C. Is quite volatile with steam. It was found to be a primary amine. It forms with acids well characterized salts.

Paraamidocaprylbenzene.

C_8H_{17}, C_6H_4, NH_2

Obtained by heating aniline-zinc chloride with capryl alcohol. It is a colorless, odorless oily fluid which boils at 290–292° (corr.); but does not congeal at — 20° C. If heated with chloroform and alcoholic potash it gives the caprylamine reaction. It forms salts with acids.

Amidooctyltoluene.

C_8H_{17}, CH_3, C_6H_3, NH_2

may be obtained by heating 30 grms. o-toluidine-zinc chloride with 8 g. normal octyl alcohol for 7–8 hours at 280° C. It is, when fresh, colorless and odorless. Boils at 324–326°, but does not congeal at — 20°. Yields 45–50% of the weight of the octyl alcohol used. (*Ber. d. chem. Gesell., 1885*, **131.**) J. H. S., Jr.

β-Hydroxybutyric Acid in Diabetic Urine. DEICHMULLER, SZYMANSKI, and TOLLENS.

That this acid occurs in diabetic urine has been observed by several workers of late. The authors have made a more careful and thorough research, however, proving conclusively its existence. Some thirty litres of urine were evaporated to a syrup, neutralized with sodium carbonate and crystallized over sulphuric acid. The crystals were pressed and recrystallized. They are deliquescent. Of the sodium carbonate 8.3 grams were used for neutralization but the crystals were obtained in very small amount. By various reactions and by ultimate analysis they were shown to be β-hydroxybutyrate of sodium. (*Annalen d. Chem*, **228**, *92*.) F. P. V.

A Polymeric Dichloracetonitril. A. WEDDIGE and M. KÖRNER.

On conducting dry hydrochloric acid through dichloracetonitril, a crystalline, easily decomposable addition-product is gotten. On heating this several hours at 130°–140°, in closed tubes, it breaks up into its components and the dichloracetonitril is polymerized. It crystallizes in large prisms, melting at 69°–70°, is soluble in alcohol, ether and benzol, and, with more difficulty, in water. Trichloracetonitril can be polymerized in the same way. Attempts with the monoacetonitril have not as yet succeeded. (*J. f. prakt. Chem*, **31**, *176*.) F. P. V.

ANALYTICAL CHEMISTRY.

A New Absorbent for Oxygen. VON DER PFORDTEN.

Heated copper does not entirely free gases from traces of oxygen, and, of course, could not be used to purify sulphuretted hydrogen. The same objections obtain with regard to other ordinary absorbents of oxygen. The author recommends the use of chromous chloride which he prepares by heating chromic acid with concentrated hydrochloric acid, reducing with zinc and hydrochloric acid, precipitating, in absence of air, with sodium acetate and dissolving this precipitate, as needed, in hydrochloric acid. The absorption is thorough, the change of color affords a test for the com-

pletion of the absorption and sulphuretted hydrogen and similar gases have no effect upon it. Nascent hydrogen combines apparently with all oxygen; hence the stream of hydrogen needs no purification. (*Annalen d. Chem*, **228**, *112.*) F. P. V.

Quantitative Separation of Chlorine and Bromine. EMIL BERGLUND.

The method is based on the two facts: first, that a mixture of potassium bisulphate and permanganate sets free all bromine in a solution of bromide and has no action upon chlorides; second, free bromine can easily be driven out of a solution by means of an air current. This, the author proves by experiments. The presence of bromide lessens the power of chlorides to resist the action of the above mixture, consequently, in the experiments, the duration of air current and strength of solution must both be cared for. Special modifications are necessary where the sample exceeds one gramme. The bromine may be determined by loss or absorbed in a solution of caustic soda and determined. A diagram of absorption apparatus is given. (*Zeit. f. anal. Chem*, **24**, *184.*) F. P. V.

Analysis of Vulcanized Rubber with Especial Regard to the Determination of Sulphur. B. UNGER.

Detailed directions are given for the determination of sulphur. Antimony and calcium in vulcanized rubber—the sulphur by fusion of the finely cut sample with copper oxide and sodium carbonate—antimony by fusion with sodium sulphide, and calcium by incineration of sample, solution in hydrochloric acid, separation of antimony with ammonia and determination of calcium as oxalate. The methods yield satisfactory results. (*Zeit. f. anal. Chem*, **24**, *167.*) F. P. V.

Determination of Phosphoric Acid. C. GLASER.

This method depends upon the fact that phosphoric acid, in the presence of calcium compounds, with use of ammonium citrate, is precipitated direct by magnesia mixture, provided that sulphuric acid enough is present to transform all calcium compounds into sulphate and no more citrate is used than is necessary to retain the calcium salts in solution. The magnesia mixture is made up with

magnesium sulphate and the first precipitate is dissolved in dilute sulphuric acid and reprecipitated. (*Zeit. f. anal. Chem*, **24**, *178.*) F. P. V.

Remarks upon Mohr's Article on the Determination of Reverted Phosphoric Acid. H. PETERMAN.

The utility of some of Mohr's suggested improvements in the determination of reverted phosphoric acid (*Zeitschr.* **23**, 487,) is discussed, and it is also pointed out that the same suggestions have been made before. (*Zeit. f. anal. Chem*, **24**, *175.*)

F. P. V.

Determination of Reverted Phosphoric Acid by the Oxalate Method Compared with the Modification of the Standard Citrate Method. C. GLASER.

Where the phosphates have but a slight percentage of iron, the oxalate and citrate methods yield similar results. In the case of guanos (natural) and iron phosphates a further modification is necessary. (*Zeit. f. anal. Chem*, **24**, *181.*) F. P. V.

Remarks upon Mohr's Article on the Determination of Reverted Phosphoric Acid. C. GLASER.

In addition to the remarks of Mohr upon the determination of reverted phosphoric acid, the author points out the needed caution that an abundance of sulphate be present. (*Zeit. f. anal. Chem*, **24**, *180.*) F. P. V.

Soap Analysis. A. GAWALOOSKI.

In analysis of soaps where the fatty acids are to be dissolved in petroleum-ether, they must first be dried (consuming many hours) as the moist acids dissolve and filter very slowly. If, however, a few c. c. of absolute alcohol are added, the solution and filtration proceeds rapidly, avoiding all necesssity for drying. (*Zeit. anal. Chem.*, **24**, *219.*) F. P. V.

Determination of Nitrogen by the Kjeldahl Method. E. BOSSHARD.

A table of analyses is given showing the accurate results obtained by this method. Presence of potassium nitrate in the caustic

soda which is distilled over zinc filings must be avoided, however, else ammonia will be formed and carried over in the distillate. Very little zinc and slight excess of caustic soda should be used, as pure caustic soda solution gives, with zinc, a strongly alkaline distillate. (*Zeit. anal. Chem.*, **24**, *199.*) F. P. V.

Detection of Citric Acid. C. MANN.

One grm. of crystallized citric acid and .6–.8 grm. glycerine are melted in a small evaporating dish, heating until a solid porous mass is left. This is made slightly ammoniacal (evaporating off excess of ammonia solution) and, while warm, 1 to 3 drops of fuming nitric acid (5 times diluted) or of an ordinary 8–10 p. c. hydrogen dioxide solution are added. This gives an intense green color. Excess of acid decolorizes. With certain amounts of acid a dark blue is given. Tartaric and malic acids do not give this reaction. (*Zeit. anal. Chem.*, **24**, *201.*) F. P. V.

Analytical Operations and Apparatus. H. R. WOLLERY.

Apparatus for distilling, for measuring vapor tension, for maintaining uniform temperature by means of water, for drying in an air current or in vacuum, and for generating gases, are described. For diagrams and descriptions reference must be made to the original article. (*Zeit. anal. Chem.*, **24**, *202.*) F. P. V.

Abstracts of American Patents Relating to Chemistry.

(*From the Official Gazette of the U. S. Patent Office.*)

June 2d, 1885.

318,971.—Absorption ice-machine. C. H. Evans.

318,972.—Process of making ammonium sulphate. E. A. Fales.

The vapor from the distillation of ammoniacal liquor is passed through sulphuric acid, covered with a layer of coal tar.

318,985.—Manufacture of thermometers. J. J. Hicks.

The thermometer tubes, after being filled with mercury, etc., are submitted for a considerable time to a temperature higher than that which they are required to indicate.

319,032.—Chromium mordant. R. Silberberg.

Consists of chromium oxalate, prepared by adding to a solution of potassium bichromate and nitric acid, a solution of oxalic acid in water and glycerine, then boiling the solutions and drawing off the clear liquor.

319,077.—Manufacture of beet sugar. E. F. Dyer.

319,079.—Composition of matter for the preservation of paper or vegetable tubing. Used for the insulation of telegraph wires. J. W. Ellis.

Consists of asphaltum, resin, petroleum, vulcanized rubber and sulphur.

319,082.—Manufacture of saccharine compounds. C. Fahlberg.

The new saccharine compound is toluene-monosulphamid. It is prepared by converting toluene into toluene monosulpho acid, oxidizing this acid or its salts to sulphobenzoic or it salts, then treating the latter with phosphorus pentachloride and ammonium hydrate, or carbonate, and finally separating the pure saccharine from the ammonium salt.

319,084.—Preparation and production of insulating materials. J. A. Fleming.

Consists of vegetable fibre impregnated with a mixture of melted bitumen, the silicates of magnesia, lime, iron and alumina, and amber or other resin.

319,097.—Soap for restoring color to plushes, velvets, etc. A. Kendall.

The soap contains a coloring matter which is imparted to the article to be cleansed when applied.

319,100.—Composition for fireproofing fabrics. F. Konrad.

Consists of a solution of ammonium sulphate, ammonium carbonate, borax, mercuric chloride, peppermint, carbolic acid, sodium bitungstate and chloride of lime, transformed into an emulsion by leading into the solution the products obtained by the distillation of a solution of Peruvian balsam and camphor.

319,108.—Compound liquid for use in the art of refrigeration. J. H. E Mendès.

Consists of sulphurous acid more or less saturated with carbonic acid in solution.

319,111.—Gas meter. W. N. Milsted.

Gas being supplied under constant pressure, quality is indicated by the height of flame.

319,118.—Solution of cuprous chloride, etc., for treating ores. A. Patchen.

Cupric sulphate is heated under pressure with salt, water and metallic copper.

319,125.—Process of working and using asphaltum. J. Rice and A. Steiger.

Pure native asphaltum is softened with hot water or steam and pressed under heated rolls.

319,128.—Lacquer for use in soldering. W. Rosenberg.

Consists of kauri gum, rosin, alcohol and benzine.

319,136.—Process of graining skins. E. Schroeder.

The grain side of the skin is swabbed with a mixture of nitric and muriatic acids.

319,180.—Furnace for preparing artificial fuel. V. Bietrix.

319,239.—Apparatus for making sulphocyanides. U. de Günzberg and J. Pscherniac.

319,270.—Apparatus for cleaning the residuum from zinc retorts. W. Lanyon and R. H. Lanyon.

319,295.—Method of treating vegetable fibre for manufacture of paper pulp. D. Minthorn.

The fibre is treated with a solvent containing hydrofluoric, sulphurous and boracic acid.

319,315.—Manufacture of starch, glucose, etc. P. Radenhausen.

Ammoniacal putrefaction in the starch milk is prevented, and the solid matters precipated by sulphuric acid.

319,323.—Detergent. C. Robinson.

A detergent for cleaning wall paper, composed of rye flour, wheat flour, corn starch, glue and yeast.

319,364.—Means for detecting and carrying off leakage from gas mains. G. Westinghouse, Jr.

319,365.—Pipe line for gas supply. G. Westinghouse, Jr.

319,409.—Apparatus for bleaching liquids. M. Hanford and C. C. Hanford.

319,434.—Apparatus for generating cold artificially. W. C. Wren.

June 9th, 1885.

319,503.—Obtaining a substitute for albumen from fish roe. J. M. Ordway.

The roe are dissolved in ammonia and precipitated by an acid.

319,604.—Apparatus for manufacturing lampblack. P. Meff.

319,646.—Process of obtaining coloring matter from amidoazoabenzol and homologues. L. Vignon.

A solution of amidoazobenzol hydrochloride, hydrocloric acid and water, heated 140° to 176° F., is reduced by sodium sulphide. After the reduction is complete, the solution is filtered off and oxidized.

319,687.—Process of electrodeposition of copper. M. G. Farmer.

The copper is deposited from a bath of ammonium copper nitrate.

319,806.—Waterproof wood pulp board for roofing. J. F. Fogg.

A combination of wood pulp with a mixture of petroleum, rosin, alum and copperas.

319,854.—Composition for soap. E. Schaal.

June 16th, 1885.

319,951.—Paint. C. E. Brown.

Consists of white glue, dark glue, alum, salt, red iron ore, green bay umber, yellow ochre, and coal tar.

319,956.—Apparatus for the recovery of soda. F. A. Cloudman.

319,971.—Apparatus for distilling glycerin. R. Giebermann.

319,984.—Mixed paint. T. N. Le Ross.

Consists of magnesium sulphate, glue, white lead and oil.

320,002.—Ventilator for gas mains. J. J. Ricketts.

320,009.—Composition for crayons. J. J. Sleeper and H. A. Johns.

Consists of water, kaolin, wheat flour, soapstone and paris-white.

320,060.—Apparatus for mixing aeriform fluids. A. B. Griffen.

320,078.—Gas-making apparatus. T. F. Martin.

320,110.—Apparatus for carbonizing bones, &c. A. Zwillinger.

320,144.—Apparatus for cooling and freezing fluids. A. Kux.

320,256.—Process of making sodium carbonate, A. Kayser.

Sodium sulphate is heated to a low red heat, below its melting point, and a current of carbon dioxide and carbon monoxide is caused to pass through the heated sulphate. Sodium carbonate is formed and sulphur dioxide is given off. The sulphur dioxide generated is used for converting common salt into the sulphate.

320,274.—Oil filter. D. S. Neiman.

320,305.—Cooling and separating a lubricating agent from a compressed gas, and liquefaction of gases and production of refrigeration. J. J. Suckert.

320,306.—Process of liquefying gases and producing refrigeration. J. J. Suckert.

320,307.—Method of and apparatus for purifying and liquefying gases and producing refrigeration. J. J. Suckert.

320,308.—Process of separating and cooling a sealing or lubricating liquid in apparatus for producing refrigeration. J. J. Suckert.

320,309.—Separating and cooling a sealing or lubricating liquid in producing refrigeration. J. J. Suckert.

320,310.—Method of and apparatus for separating a liquefiable gas from a condensable vapor. J. J. Suckert.

320,361.—Method of preparing and treating starch. W. T. Jebb.

A wort, suitable for the manufacture of beer or ale, is produced by steeping corn, and then draining and coarsely crushing or grinding it. The crude starch is separated by sifting and mashed with barley malt.

320,377.—Process of electro depositing nickel. J. A. Mathien.

Brief. Uses nickel proportionate.

320,400.—Manufacture of starch. J. C. Schuman.

Indian corn is steeped, drained and ground, and the starch separated by sifting.

320,401.—Method of preparing and treating starch. J. C. Schuman.

320,402.—Manufacture of starch. J. C. Schuman.

320,403.—Manufacture of grape sugar and glucose. J. C. Schuman.

320,417.—Process of extracting arsenic and mercury contained in the residues obtained in the distillation of mercurial ores. A. Van Straater.

June 23d, 1885.

320,460.—Carburetor. F. Copeland.

Brief. Oil is fed to the carburetor through a measuring valve having a pointer arranged over a graduated plate to indicate the quantity of oil passing through the valve. The carburetor is surrounded by a steam coil, and has a steam heating chamber at the bottom for maintaining the proper temperature.

320,461.—Blow pipe. G. D. Cowen.

320,464.—Varnish. W. E. B. Davies.

Consists of rosin, crude turpentine, naphtha, black oxide of manganese, oxide of lead, umber, essence of bergamot and linseed oil.

320,516.—Glass and other furnaces of the regenerative type. E. Walsh, jr.

320,526.—Process of preparing logwood extract. C. E. Avery.

The logwood liquors or extracts are oxidized, before being mingled with mordants, by the addition of various oxidizing agents.

320,535.—Combined beer and spirit still. D. S. Brown and L. Sipf.

320,583.—Explosive compound. R. S. Penniman.

Consists of nitrate of ammonia, protected from contact with the atmosphere by a coating of petroleum or its products, in combination with chlorate of potash.

320,590.—Process of purifying hyposulphite leaching solutions. E. H. Russell.

After the precious metals have been precipitated from the leaching solution the caustic alkalies are removed by the addition of a soluble salt of iron.

320,603.—Process of tanning. E. S. Ward.

320,627.—Method of coking coal. A. M. Chambers and T. Smith.

320,819.—Process of making refined cast steel and of steel coating wrought iron. T. Sheehan.

Wrought iron is packed in an annealing box, in a compound of charcoal, sodium chloride, sodium bicarbonate, sodium bisulphite, zinc sulphate and broken lime stone.

320,820.—Process of dyeing. R. Silberberg.

320,821.—Mordant. R. Silberberg.

Consists of a mixture of solutions of chromium oxalate and sodium hydrate.

(June 30th, 1885.)

320,908.—Smelting ores. M. B. Brett.

320,911.—Apparatus for treating the products of rendering tanks. L. J. Cadwell.

320,921.—Compound for insulating electric wires. R. S. Ferguson, W. Schumacher and W. Tubman.

Consists of pine pitch, rubber, and asbestus, mixed with beeswax, tallow or linseed oil.

321,003.—Ore roasting furnace. W. Brückner.

321,025.—Evaporating apparatus for brine, &c. M. P. Hayes.

321,026.—Neutral sizing material for papermakers' use. R. A. Fischer.

321,092.—Neutral sizing material for papermakers' use. R. A. Fischer.

Consists essentially of a mixture of aluminium and zinc sulphate, free from iron, prepared by neutralizing a solution of aluminium sulphate with zinc oxide, evaporating till the mass becomes viscous, then adding sodium bicarbonate, and breaking up the porous mass after cooling.

321,094.—Manufacture of an aluminous sizing material for papermakers' use. R. A. Fischer.

321,095.—**321,098.**—Do.

321,109.—Calcimine. K. A. Hohenstein.

Consists of lime, caseine, borax and a soluble gum.

321,120.—Art of manufacturing Portland cement. R. W. Lesley and D. Griffith.

321,121.—Manufacture of cement. R. W. Lesley and D. Griffith.

The ground cement is subjected to the action of a current of moist air.

321,124.—Apparatus for the manufacture of gas. W. F. C. M. McCarty.

321,125.—Process of making gas. W. F. C. M. McCarty.

Natural gas is subjected to heat, in the presence of steam; the mixture is then reduced by finely divided iron or other material, after which it is passed through heated carbon, and finally it is superheated.

321,137.—Composition of matter for facing brown stone and for making artificial stone. B. E. Ratcliffe.

Consists of oil, sand and litharge.

321,161.—Chemical fire extinguisher. J. A. Wagner.

321,169.—Art of making whiskey. F. M. Young.

The mash is acidified by the addition of liquid slop, to prevent the subsequent formation of acid, at the expense of the sugar and starch.

321,341.—Process of making sodium sulphite. E. Carey, H. Gaskell, jr., and F. Hurter.

Salts are exposed to the action of sulphurous acid gas.

321,347.—Manufacture of salt. J. M Duncan.

321,368.—Disinfecting compound. F. Jossa.

Consists of calcium sulphate, ferrous sulphate, borax, sodium chloride, sodium bicarbonate and water.

321,410.—Vulcanized soft rubber and process of making same. F. Wilhöft.

Rubber and sulphur are exposed to a minimum heat of 330° F.

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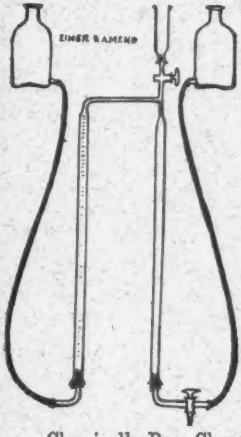

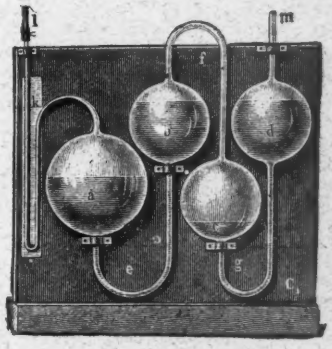

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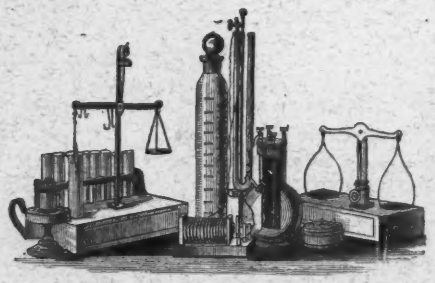

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